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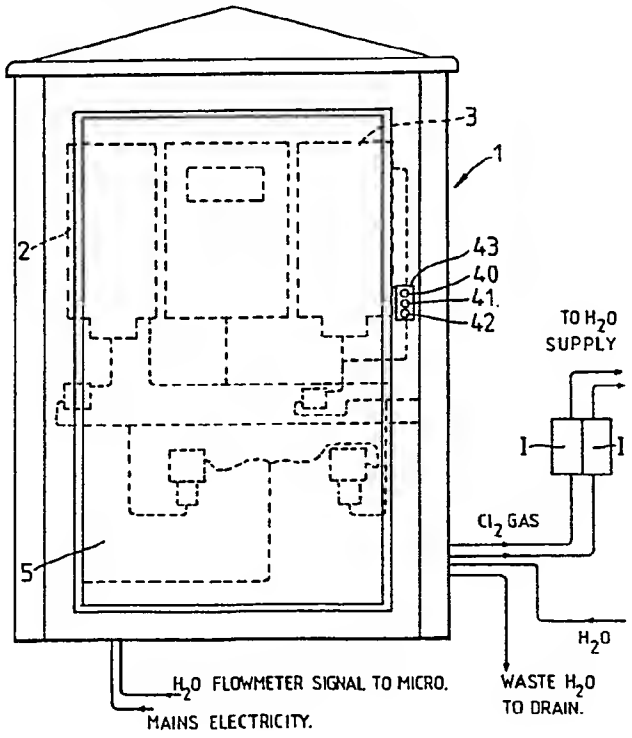
(54) Transportable water treatment apparatus

(57) A transportable cabin 1 is fitted out with water treatment equipment e.g. for addition of chlorine, fluorine and/or sulphur dioxide. Cabin 1 and water treatment equipment comprise a complete and fully equipped water treatment station which can be readily connected to a water supply on site to begin working immediately and should the treatment station no longer be needed the cabin 1 can be readily disconnected from the water supply and transported to an alternative site location or storage depot. The cabin may be provided with water quality analysers, a microprocessor for controlling injection of the additive, and an alarm system.

FIG.1.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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FIG.1.

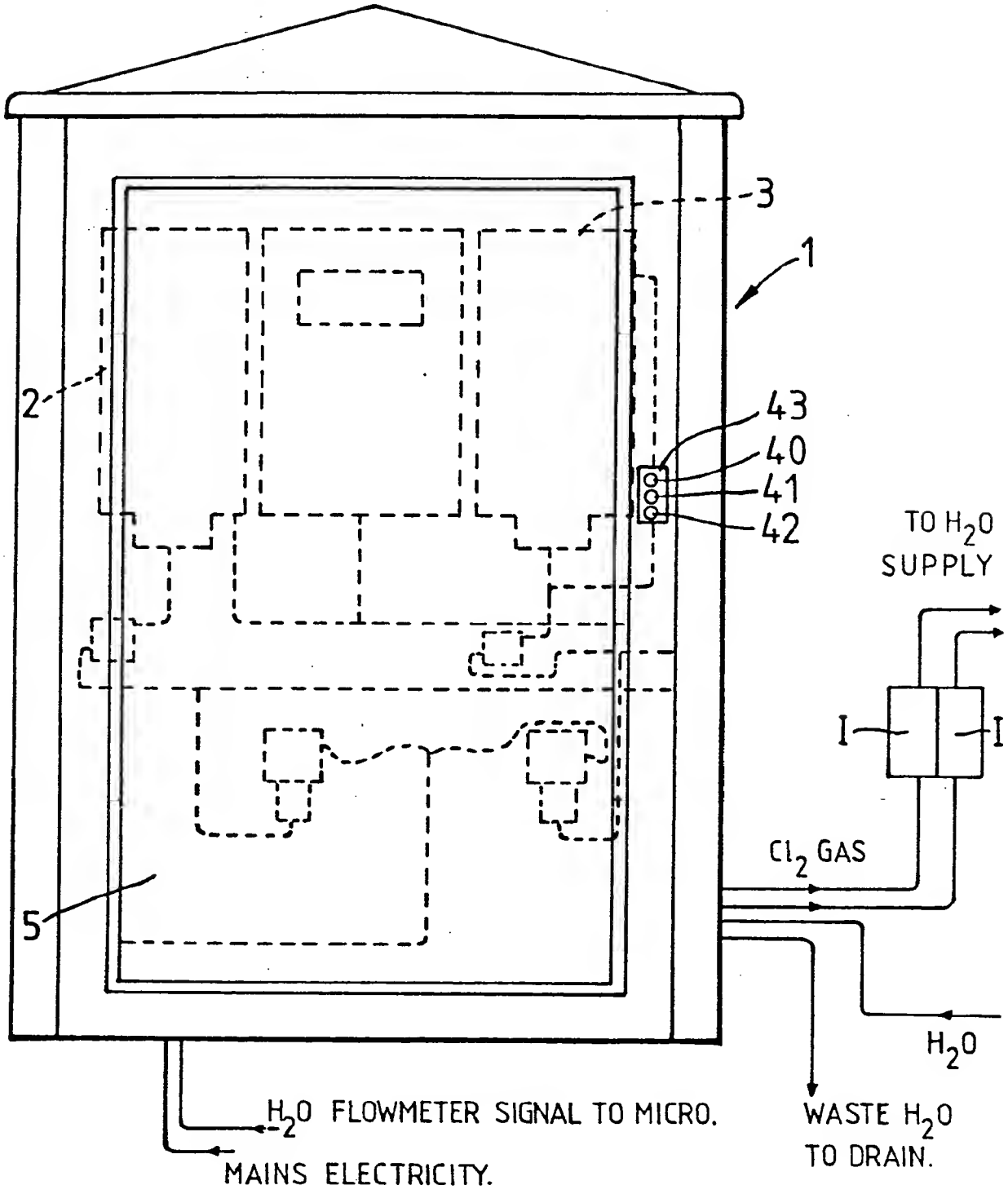


FIG.2.

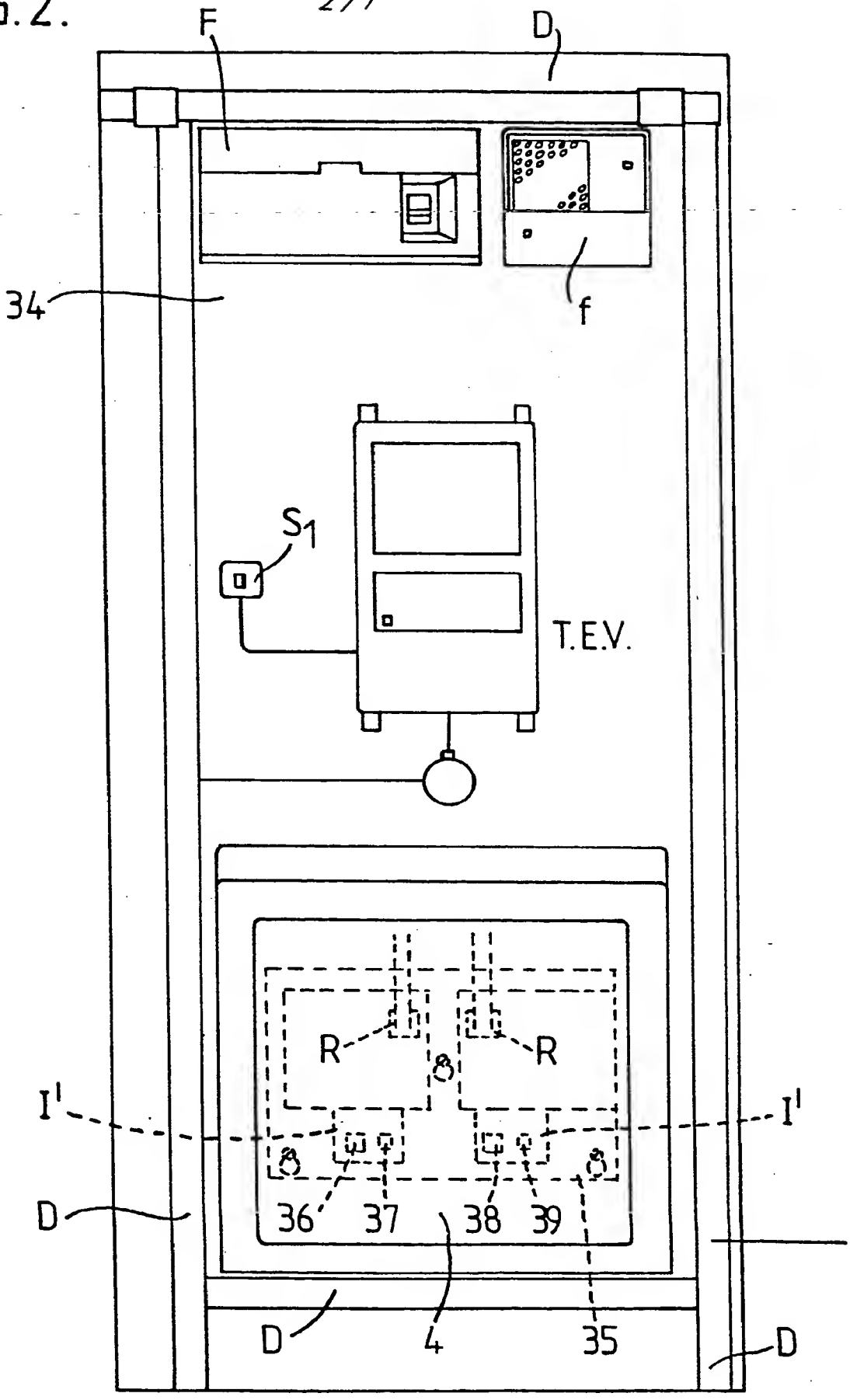


FIG.2. cont.

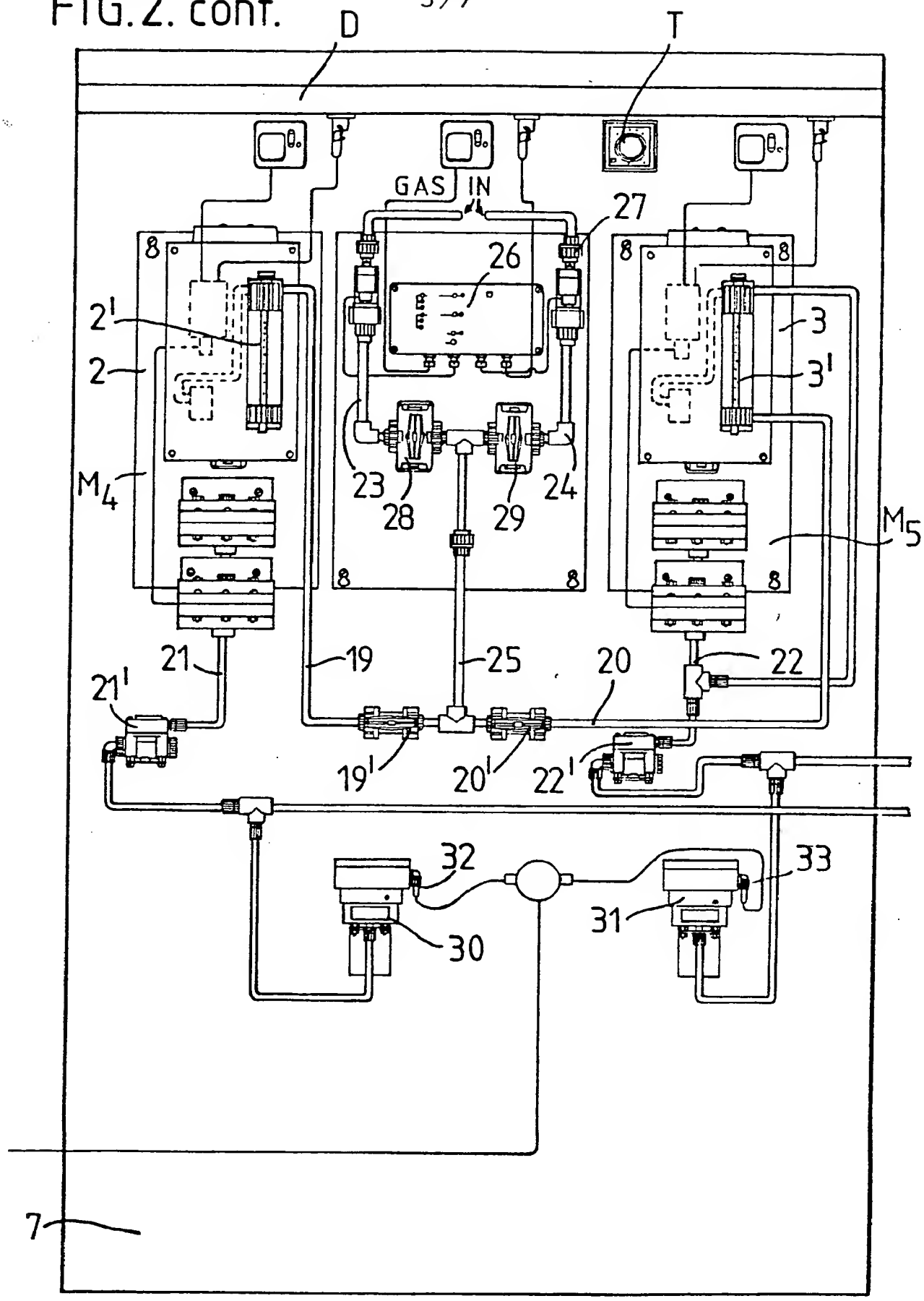


FIG. 2. cont.

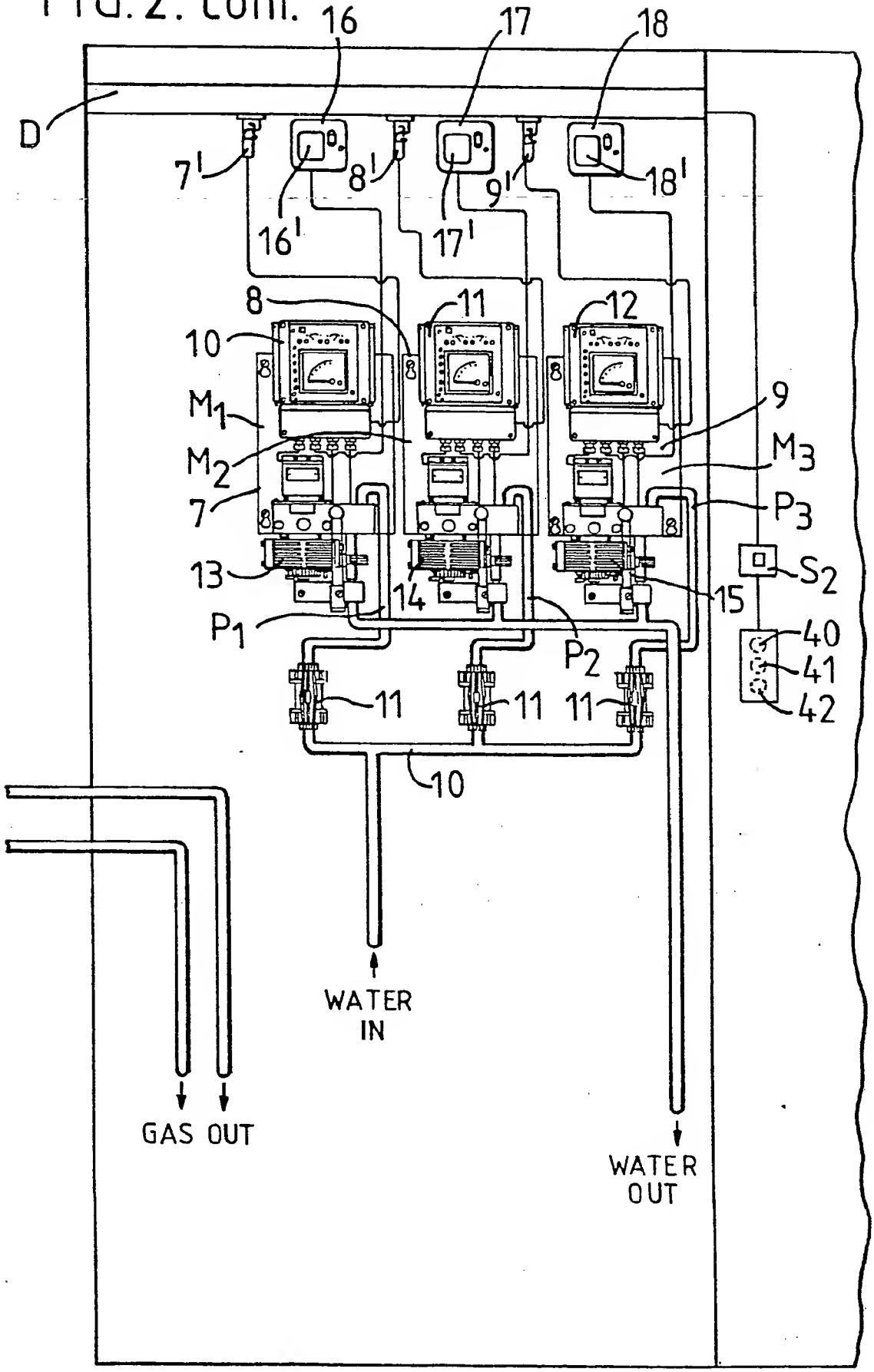


FIG. 3.

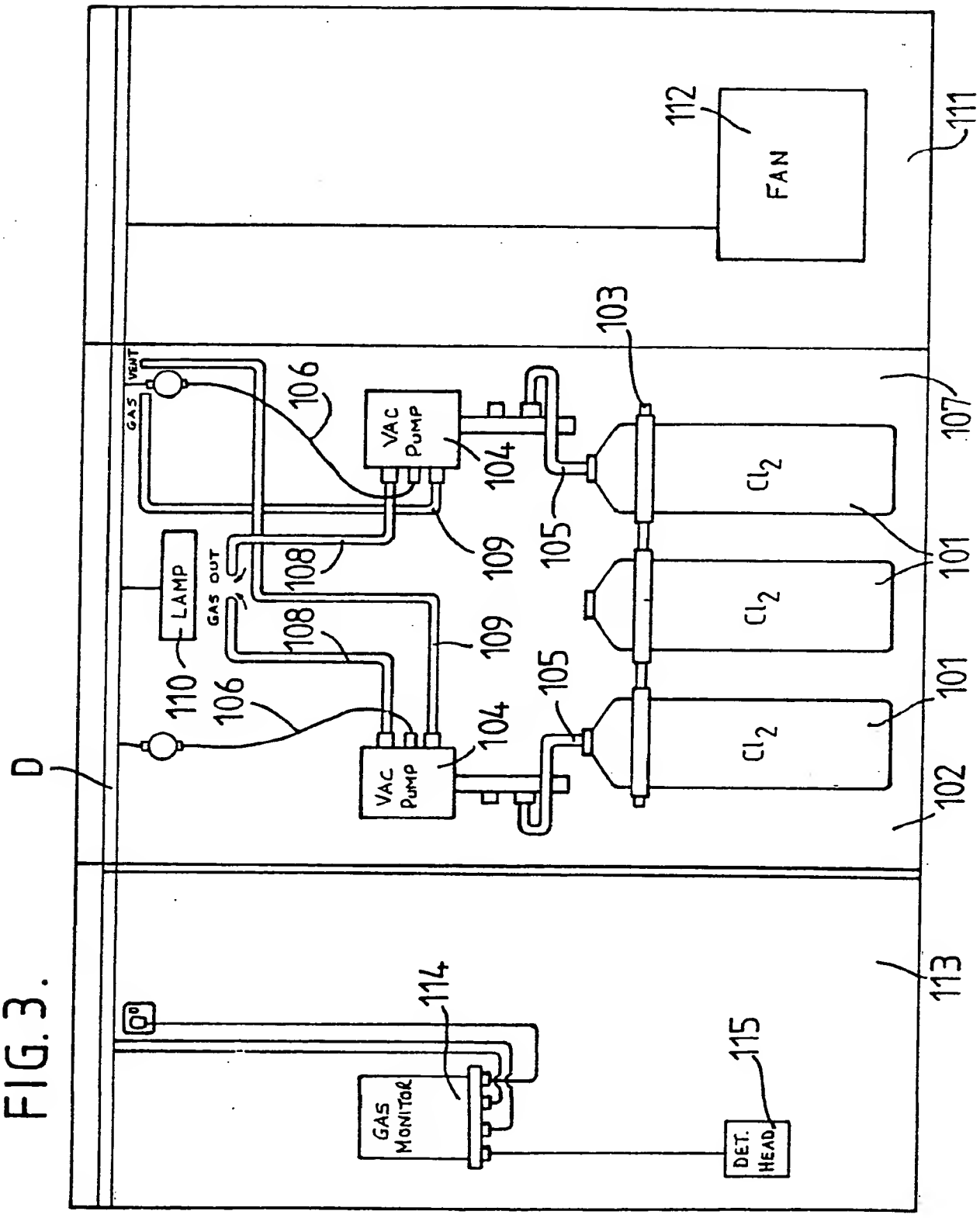


FIG.4.

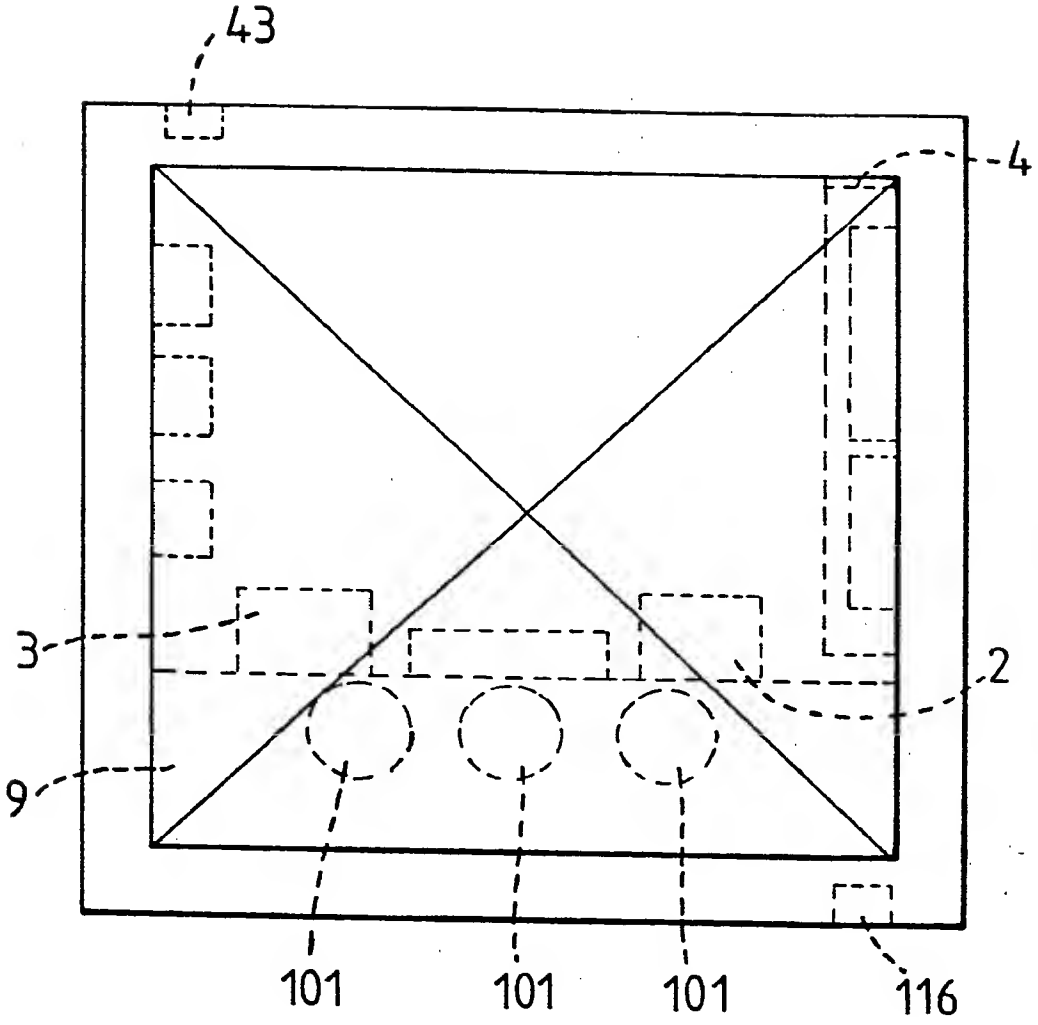
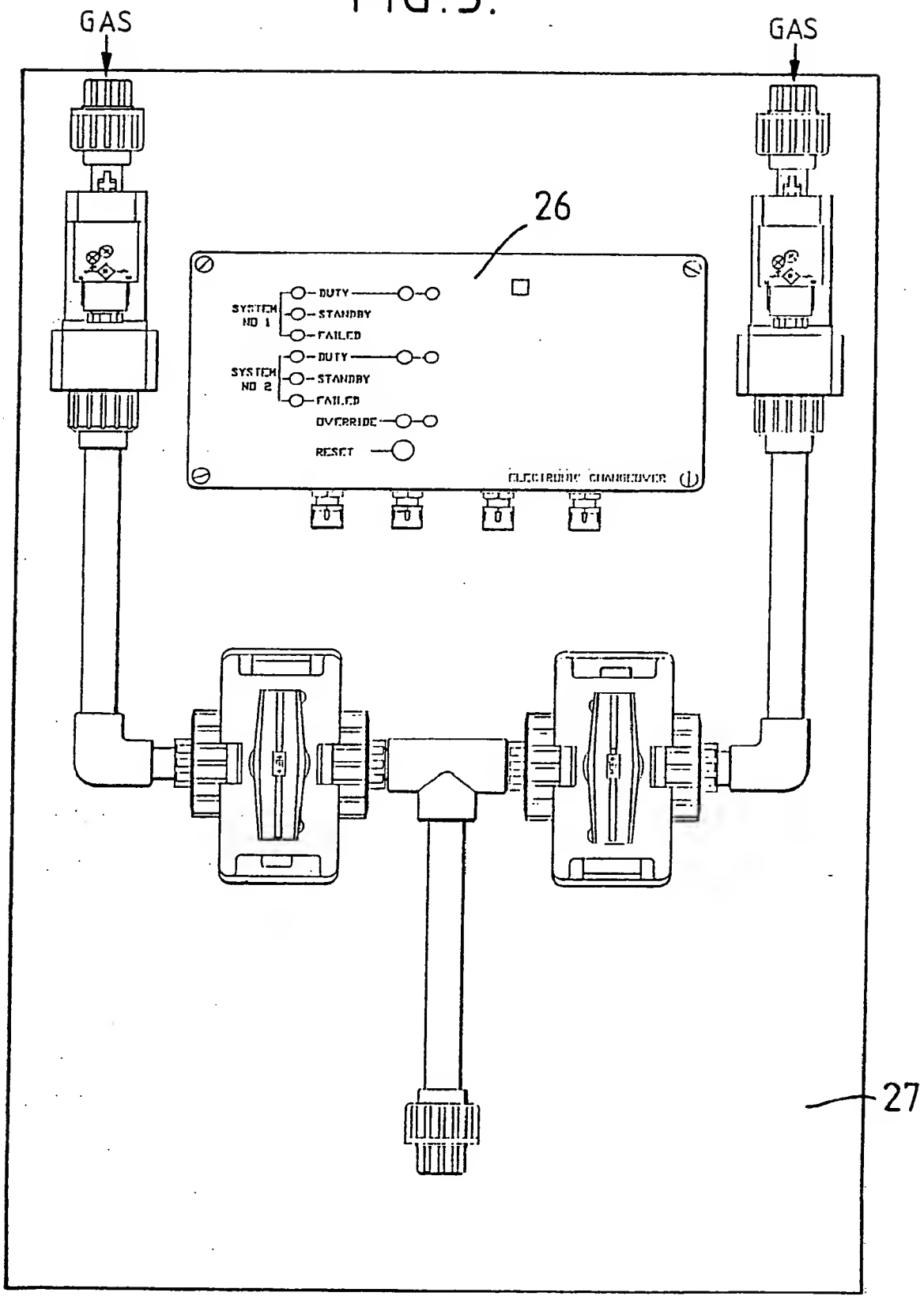


FIG.5.



IMPROVEMENTS IN OR RELATING TO WATER TREATMENT

This invention relates to improvements in or relating to water treatment and is more particularly but not exclusively concerned with water chlorination systems.

In order to supply water of the correct quality to the consumer, water treatment systems (for example chlorination systems) are normally tailor-made purpose-built systems installed in situ at a particular site. for example close to a bore hole which feeds a water reservoir and/or close to the reservoir itself. Of course, the size and capacity of the water treatment system will depend upon the size and needs of the consumers and indeed the water may be required to travel a considerable distance from the purpose-built treatment system to the various consumers. On the other hand, a relatively small system (for example a chlorination system utililating 200 lbs of chlorine gas per day) may be used at a particular site close to the water supply to service a considerably smaller number of consumers (for example the smaller consumer area may be the size of a village). The design and installation of such water chlorination systems can be time consuming since each system is tailored to the amount of space available and sometimes it may be necessary to erect a special pump-house. Such systems are usually single manually operated

systems with no back up chlorine injection supply should the chlorine injector fail for any reason. Most importantly such systems tend to be disadvantageous where the water has to travel a considerable distance to the consumer since the chlorine level in the water deteriorates over distance travelled. Thus, on reaching the consumer the chlorination level in the water actually supplied to the consumer may be insufficient. Once again, once a purpose-made chlorination system becomes redundant, in order to utilise the system again (or parts thereof) a time-consuming dismantling exercise would be required for disconnecting all the various components of the system with a view to utilisation of same at another site sometime in the future. Most components of the system are "hard-wired" increasing the difficulty of disconnection of the various components. Once again, when there is a malfunction of the system the detection of the malfunction may not be effected as readily as might be the case, and once the fault has been detected a relatively large amount of time may be required in disconnecting a faulty component and replacing same with a new one. Additionally, it is believed that safety measures relating to leakage of chlorine gas from the chlorination system could be improved.

It is an object of the present invention to provide a water treatment system which is improved in at least some respect and/or which at least alleviates one or more

of the aforementioned, or other, disadvantages is associated with known water treatment systems.

According to one aspect of the present invention there is provided a water treatment apparatus comprising a transportable module or cabin fitted with water treatment equipment, the cabin or module being adapted for transportation to a site and for connection of the water treatment equipment to a water supply near to the site.

By the present invention, the cabin or module can be completely fitted out with equipment needed for a particular job requirement and this could be done at a factory site where all the equipment necessary is readily to hand and then the cabin or module can be transported while fully fitted out with the required equipment where it can readily and easily be connected-up (usually in a readily disconnectable manner) to the water supply.

Such a water treatment apparatus has a clear and distinct advantage over and above any system which has to be installed as a number of separate components assembled together at a particular site, which involves the transportation of all the individual bits and components to the particular site concerned and which would not provide a readily disconnectable system removable from the water supply as a single module or unit.

Additionally, in practice the water treatment equipment fitted inside the cabin or module itself may become standardised such that one design and assembly of components may be multi-functional and suit a variety of different job requirements.

Usually, the water treatment equipment will include a chlorine injection system but could additionally or alternatively include fluorine injection and/or sulphur dioxide injection (sulphur dioxide can be used to regulate the level of chlorine and in particular to remove excess chlorine from the water supply). It is envisaged that a variety of water treatment systems could be carried out within the cabin or module.

In one embodiment of the present invention the water treatment apparatus comprises a cabin adapted for connection to a mains electricity supply and fitted with at least one water sample analyser, said water sample quality analyser being adapted for connection to a water supply in order to extract samples of water and to discharge the sample water through a waste outlet into a drain on the site. The cabin has a chlorine gas injector (in fact the chlorine could be injected in a gaseous or liquid form if desired and/or fluorine could be injected) and injection of the chlorine is controlled by a computer. On evaluation of data provided by said water quality analyser (and preferably also in accordance with

measured water flow rates in the supply). Preferably, a back-up chlorine injector is provided in the cabin or module and said cabin may be connected to the water supply in order to treat the water merely by connecting up the water supply pipe to the at least one sample water quality analyser and connecting the waste water outlet from said analyser to the drain and the chlorine supply pipes from the gas injectors being connected to a further injector located outside the cabin or module close to the water supply pipe itself. Preferably, the cabin or module has an air-tight compartment housing gas or liquid (for example chlorine or fluorine) utilised in the water treatment and the gas will usually be housed in canisters or bottles in the sealed compartment. The airtight gas storage compartment is advantageous because any gas leakage may thus be able to be contained within the airtight space separated from the remainder of the cabin containing the water treatment equipment. In one embodiment, the storage compartment is provided with its own door in order to allow access only to the gas storage compartment, said cabin having a further door which allows access only to the water treatment equipment. Clearly, separating the water treatment equipment which needs to be checked periodically by a maintenance engineer away from the gas bottles or canisters themselves (housed in an airtight storage compartment) increases the safety standards for the maintenance engineer very considerably over known systems which do

not provide for any containment of gas leaking from the gas supply source. Additionally, separating the treatment equipment from the gas source allows the equipment to remain unaffected by any gas leakage from said source which may not be the case with other arrangements. Additionally, should only the gas canisters or bottles need replacing or checking independent access to the storage compartment is possible via its own door so that the door to the water treatment equipment does not have to be opened.

Additionally, the cabin or module is preferably provided with an alarm warning system which will give an indication of equipment malfunction and/or low gas leakage and/or high gas leakage and/or verification that all systems are normal. Where said cabin or module is provided with a separate airtight storage compartment for the gas source, then preferably such a warning system is fitted independently to said storage compartment.

Further according to the present invention there is provided a method of treating water, for example, injecting chlorine in the required dosage amounts into a water supply said method comprising:

(a) fitting out a cabin or module with water treatment equipment;

(b) transporting said cabin or module to a site and connecting same to the water supply in order to

treat the water as and when required, the arrangement being such that the cabin or module can be disconnected from the water supply and removed from the site as a unit for use at another site should it become redundant at the site.

Further according to the present invention there is provided a method of treating water comprising installing a series of water treatment cabins or modules along a water supply system in order to monitor the quality of the water at various locations along the water supply line and to treat the water at that location (for example by the injection of chlorine) as and when required, said cabins or modules each being fitted out with water treatment equipment and being adapted for connection to and disconnection from the water supply as a unit.

Still further according to the present invention there is provided a portable water treatment station which is in the form of a unit fitted out with water treatment equipment which may readily be connected up on site to a water supply. The only connections necessary for connecting in the water treatment station may be for water input to the treatment station, water output for waste water from the unit and an outlet from the unit, arranged in use to carry chlorine gas or other additives for treating the water. Additionally, usually there will be a connection provided to mains electricity although it

is conceivable that the unit may have its own generator or power source.

Further according to the present invention there is provided a portable water treatment station fitted out with water treatment equipment, the arrangement being such that the station can be transported to a site and connected up to sample the quality of the water and to automatically administer treatment to the water under the control of a computer housed within said water treatment station, said water treatment station further housing a supply of a water treatment additive (for example chlorine). The supply of water treatment additive is preferably, housed within an airtight sealed compartment within the water treatment station, which compartment is isolated from the water quality analysing equipment, water treatment administering equipment and computer control.

Many advantageous features of the present invention will be apparent from the following description and drawings.

An embodiment of water treatment apparatus and method in accordance with the present invention will now be described, by way of example only, with reference to the accompanying simplified, diagrammatic drawings in which:

FIGURE 1 shows water treatment apparatus in the form of a cabin or module and various service connections;

FIGURE 2 shows a schematic view of the interior layout of the inside of the cabin which may be accessed through the front door of the cabin shown in FIGURE 1;

FIGURE 3 shows a schematic view of the interior of the cabin shown in FIGURE 1 but comprising a gas cannister storage compartment which may be accessed through a back door of the cabin;

FIGURE 4 is a plan view of the cabin shown in FIGURE 1; and

FIGURE 5 is an enlarged view of a water treatment control monitor.

Referring to the FIGURES of the drawings, water treatment apparatus in the form of a transportable cabin or module 1 is fitted out with water treatment equipment (shown schematically in dashed lines in FIGURE 1) which is explained more fully in relation to FIGURE 2. The cabin 1 and water treatment equipment can thus be thought of as a complete and fully equipped water treatment station comprising a portable or transportable unit which can be readily connected to a water supply on site to begin working right away and, additionally, should the

water treatment station no longer be needed the cabin can readily be disconnected from the water supply and transported to an alternative site location or even to a storage depot.

It will be appreciated that the precise arrangement of water treatment equipment within the cabin can be varied to suit all sorts of specific requirements before being transported to its particular location on site and also a virtually standardised design capable of performing multi-purpose tasks may also be generated so that the same cabin can be used for performing different jobs.

In this way, the need for designing a purpose made water treatment plant on site that has to be assembled component by component on site, is totally avoided, thereby effecting great savings in labour skill and time and, additionally, since the water treatment apparatus is in the form of a unit which can be uncoupled or coupled to the water supply it can be used again as a unit instead of having to perform the laborious exercise of dismantling all the various assembled components of a water treatment plant. In this particular example, the bottom of the cabin 1 is open and will be connected to a supporting platform (usually of concrete) on site. Thus the complete treatment station can be connected to the water supply merely by: connecting a water input (see H_2O

connection line in FIGURE 1) through into the cabin (see "water in", FIGURE 2); connecting a waste water output from the cabin 1 to a drain (see "waste H_2O to drain" in FIGURE 1 and "water out" in FIGURE 2); connecting up a water additive treatment supply line (in this example the additive is chlorine gas) through to the water supply via Cl_2 gas water interface units I (see FIGURE 1), and connecting the cabin 1 to mains electricity. In this example, the water treatment consists in the addition of chlorine gas into the water supply and two gas supply lines are provided out of the cabin from separate chlorine gas injectors 2 and 3 but if preferred only one injector and one additive supply line need be provided. Two gas supply lines are provided, in this instance, since one of the injectors 2,3 is a backup or standby unit only utilised should the first gas supply line become non-operational for any reason or run out of gas. It is believed that the idea of providing such a backup gas supply is a new concept in itself.

Additionally, and most importantly in the present instance the water treatment equipment includes a micro-computer (micro) 4 (not shown in FIGURE 1) to analyse data relating to quality of water samples taken from the water supply and, in this instance, the micro-computer is also fed with a water flowmeter signal and this signal information is also taken into account to adjust the chlorine gas dosage level into the water supply, if need

be. Thus, the presently described embodiment of the present invention provides a fully fitted, neat, space-saving cabin which can be coupled up to the water and electricity supply services by a very small number of connections in order to carry out a water treatment service and, additionally, this treatment station is fully automatic and carries a back-up water treatment unit should the primary treatment unit fail. In this instance since the chlorine gas injectors 2 and 3 are identical either one could comprise the primary water treatment unit.

FIGURE 2 shows a schematic view of the water treatment equipment contained in the cabin 1 which is accessible through the front door 5 (see FIGURE 1) of the cabin. Once the door 5 is opened, on the right-hand wall 6 of the cabin three water sample analysers 7, 8 and 9 are located. The chlorine gas injectors 2 and 3 are located on the facing wall 7 and the micro-computer 4 and triple evalidation unit T.E.V. is located on the left-hand wall 34 of the cabin.

Additionally, the cabin has a rear, airtight compartment 9 (see FIGURES 3 and 4) housing canisters of chlorine gas. Gas supply lines leading from associated chlorine gas canisters pass through the facing wall 7 (see "Gas in" in FIGURE 2 on wall 7) and the gas can be channelled to the injectors 2 and 3 as and when required.

All electric cabling can be conveniently arranged in duct work extending through vertical ducts D running vertically along corners of the cabin and also horizontally along top corners of the facing wall and adjoining side walls.

In this particular instance, the cabin 1 has a floor area of about 1.5 square metres and is about 2.2 metres high but the size could be varied to suit. The water treatment system could be used to add chlorine to the water in gaseous and/or in a liquid form and/or to administer fluorine and/or ammonia or any other viable treatment additive. Additionally, the treatment station could be fitted with ultra-violet lamps to kill any particular sort of bacteria that might be in the water. Also, the system may incorporate a sulphur dioxide injector in order to remove any excess chlorine that may be in the water. The water treatment equipment may utilise in the order of 200lbs of chlorine gas per day and will usually be maintaining a level of chlorine in the water supply of about 0.3 parts per million. The system is fully automated as opposed to the single manually operated systems that are usually employed which are assembled component by component on site.

Water Sample Analysis.

As shown in FIGURE 2 the water treatment equipment includes three independent water analysers 7, 8 and 9.

The form of each of these water analysers 7, 8 and 9 is identical and each analyser is fed from a manifold 10 connected to the "water-in" supply pipe which in use is connected up to the water supply. Manifold 10 has three supply outlets which can be opened or closed by way of three associated manual switch-off ball valves 11. Although the water treatment equipment, in this instance, includes three water quality analysers 7, 8 and 9 it is possible that the system might only employ one water sample analyser. The idea of providing three water sample analysers is to provide the micro-computer 4 with information which is as reliable as seemingly possible regarding the quality of the water supply. Indeed, before signals regarding the quality of water sampled from each of the individual water quality analysers 7, 8 and 9 is passed to the micro-computer 4 via data input lines 7', 8' and 9', the signals are conveyed through to the triple evalidation unit T.E.V. via cabling in the ducting D. The triple evalidation unit T.E.V. analyses the three data-input signals from the water quality analysers 7, 8 and 9 and interrogates the three signals in such a way as to give an average value of the water quality from the three samples and also to take into account any anomalies e.g. that one of the analysers may be defective, thereby producing a result to be fed to the micro-computer 4 which is an average of only two of the water analysers 7, 8 and 9. Of course, it is possible that two of the water analysers 7, 8 and 9 could become

defective, in which case, the signal from the remaining analyser only will be conveyed to the micro-computer 4 from the triple evalidation unit 8 for further analysis and comparison with pre-programmed information. The general format of each water quality analyser 7,8,9 is quite well known and thus will not be described here in great detail. Basically, each water analyser 7, 8 and 9 includes a meter 10, 11 or 12 giving a reading of the quality of the water sampled by the respective analyser 7, 8 or 9. In this instance, the meters 10,11,12 will read the level of chlorine present in the water sampled. Each water quality analyser 7, 8, 9 includes a cell 13, 14 and 15 for holding a sample of water fed thereinto and each sample cell is provided with various detecting probes (not shown).

A most important feature of the present invention concerns the modular approach to individual items of the water treatment equipment. In this instance, each water analyser 7, 8 or 9 is provided with its own power supply socket 16, 17, 18 and separate plug 16,', 17', 18' rather than the analysers being "hard wired" into the electricity supply. Additionally, each of the analysers 7, 8 or 9 has its own data output line 7', 8', 9' provided with a four pin plug-in connector to the data line through to the triple evalidation unit T.E.V. This is done, so that each water analyser 7, 8, 9 can be readily removed from the cabin 1 should this be desired

for any reason (for example if a malfunction has occurred). In order to remove one of the analysers it is only necessary to:-

(1) Pull out the associated plug 16', 17' or 18',
(2) disconnect the associated four pin connector on line 7', 8' or 9'
(3) pull out the flexible pipe P1, P2 or P3 which pushes into the associated analyser 7, 8 or 9,
(4) unfasten the associated mounting board M1, M2 or M3 associated with the analyser 7, 8. 9.

Each mounting board M1, M2, M3 is fastened to the cabin wall 6 by means of four screws located at the four corners of the rectangular mounting board M1, M2, M3 (only some of the screws are shown for ease of illustration). Since each of the four screws associated with each of the mounting boards M1, M2, M3 are held in keyhole slots it is only necessary to unscrew the various screws concerned in the mounting board, in order to loosen the board and then with a slight upward and outward movement from the wall the mounting board and associated components of the water analyser 7,8,9 (meter and sampling cell) can be completely removed from the cabin, and a replacement module can be fitted via a converse process in an easy manner.

Previously, should a water analyser fail for any

reason it would have been quite time consuming to isolate the fault in the analyser and to correct it whilst still being hard-wired into the system and the facility of mounting each analyser in this fashion in which it can be readily uncoupled from the remainder of the system clearly has obvious advantages and, indeed this approach is applied to other items of the water treatment equipment, in a manner yet to be explained, for example in relation to the chlorine gas injectors 2,3.

As should be evident from FIGURE 2 electrical leads are illustrated with a single line in order to avoid confusion with gas pipes and water pipes which are depicted by two parallel lines.

Chlorine Gas Injection.

On the facing wall 7 of the cabin 1, gas injectors 2 and 3 are provided as shown. These injectors 2 and 3 are generally of a known form and include a sight glass 2', 3' showing the level of chlorine gas being metered from the associated injector. Once again, since the general format of the injectors 2 and 3 is well known they will not be described in detail. However, an important improvement has been made by the Applicant since the units have been made slimmer owing to the omission of the usual interface unit included in the injector, said interface unit usually being coupled up to the micro-

processor. In the present instance, the interface units have been omitted from the site of the injectors 2,3 themselves and have instead been incorporated in the micro-processor (see I') in a manner to be explained further. Omission of the interfaces from the site of the injectors not only allows slimline injectors 2,3 to be provided but also avoids more intricate and complex cabling systems, reducing the number of lines to nine from fourteen, which would otherwise be required.

Additionally, since the interfaces for the gas injectors 2 and 3 are now provided at the microcomputer (see I') safety within the cabin 1 is improved and these interfaces I' are within a protected environment within the microcomputer housing, away from the influence of chlorine gas, in particular in the event of a gas leak. Once again, each injector 2 and 3 is mounted onto a board M4,M5 which is fastened to the cabin wall 7 by means of 4 screws located at the corners of the mounting board. To uncouple one of the injectors, 2,3 from the system and to remove it from the cabin 1 on the mounting board M4,M5 it is only necessary to undo the associated plug and four-pin connector, to uncouple the associated gas input supply pipe 19 or 20 from the associated control valve 19' or 20' and to uncouple the injector output supply pipe 21 or 22 from the associated check valve 21' or 22' in a manner which should be readily apparent from the drawings. Once the two electric connections and two gas

supply connections have been uncoupled as aforesaid, the gas injector 2 or 3 can readily be removed as a unit from cabin wall 7 simply by unscrewing the associated four screws at the corners of the mounting board M4,M5, lifting the board and outward movement of the board from the wall. Once again this is a great improvement in design over the previous systems where all components are hard wired. Chlorine gas supply pipes from the chlorine gas supply housed behind cabin wall 7, enter through the wall near the top and extend through downpipes 23,24 and into central supply pipe 25. The downpipes 23 and 24 and central pipe 25 are mounted together with a gas injection monitor control 26 on a mounting board 27 positioned in between the injectors 2 and 3. The mounting board 27 and monitor control is shown in more detail in FIGURE 6, said monitor control giving a display showing which gas injector is currently in operation. As should be evident from the drawings, the gas supply to either injector 2,3 can be isolated before entering the central pipe 25 by manually operating the associated control valve 28 or 29. The system can be arranged to run completely automatically but is provided with manually operable controls also, to override the automatic system where desired. Thus, signals from the microcomputer 4 can be sent along wiring in the ducting D through to the injectors 2,3 and monitor control 26 in order to control the supply of chlorine gas to be sent out through the gas supply pipes (see "Gas out" on cabin wall 6) to the water

supply system in a controlled manner in accordance with the quality of the water sampled from the water supply. Additionally, as aforementioned, in this system, since the amount of chlorine gas to be injected into the water supply will depend upon the flow rate of the water concerned, flowmeter signals from the water supply system are also sent to the microcomputer and taken into account in the analysis carried out by the microcomputer in order to modify the dosage of chlorine gas accordingly. Since the amount of chlorine gas injected into the water supply system is, in this instance, modified in accordance with the flow rate, advantageously a flow proportional dosage of chlorine is provided by this water treatment apparatus since it operates in real time and it is also believed that this feature alone may be a new innovative feature in water treatment systems. The system also incorporates low vacuum switches 30 and 31 which are incorporated into the electricity supply via four-pin connectors 32 and 33, rather than being hard wired so that they are also readily disconnectable from the system.

Once again the central board 27 and monitor 26 can be readily removed from the system in a manner which should be obvious from the aforegoing description in relation to removal of the water quality analysers 7,8 and 9 and gas injectors 2 and 3.

The triple evalidation unit is "hard-wired" into the

system and is connected to on/off switch S, but it is possible in an alternative embodiment for the triple evalidation unit to be constructed as part of a plug-in module.

The cabin 1 is provided with a thermostat control T, to advantageously, regulate the temperature within the cabin to keep it 10°C above freezing, in this instance, to enable the chlorine gas to remain in a gaseous rather than liquid state. A fan heater unit f is also provided which could also be arranged to vent the air from inside the cabin 1 to the atmosphere and fuze box F is positioned next to the fan heater as shown in the upper left hand corner of side wall 34.

Microcomputer Control System

The microcomputer 4 is housed on the left-hand wall 34 as shown and houses all the equipment necessary and preprogrammed data necessary for calculating the required chlorine dosage level and for issuing commands to the gas injectors 2 and 3 and control monitor 26. The main electronics for the microcomputer 4 are housed on a removable mounting board 35, represented in dashed lines in FIGURE 2. Once again this board 35 is readily removable from the computer. The board 35 is fastened in position by three screws in keyhole slots as shown and can be removed with the electronics components including the interfaces I' for the gas injectors 2 and 3, once

ribbon connectors R are uncoupled and the lines 36,37,38 and 39 to the interfaces I',I' are disconnected therefrom. The system provides for a complete interchangeability of interfaces I' with gas injectors 2,3 so that the left-hand injector I' can interface with the injector 2 or, if desired, the connections 38 and 39 can be connected up to the interface I' so that it instead interfaces with injector 3. Equally, the right-hand injector I can service either gas injector 2,3.

Thus, overall a very versatile system is provided which is able to cope readily with any manfunction (either of equipment or gas leakage).

Obviously, if only one water quality analyser 7,8 or 9 is provided then the triple evalidation unit 8 need not be provided unless it is utilised to evalidate a plurality of samples taken at different points in time by the single water quality analyser provided.

Additionally, and most importantly, the cabin 1 is provided with a warning system, which in this case includes three warning lights 40,41 and 42 housed in the alarm cell 43 visible from the outside of the cabin (see FIGURE 1). The alarm cell is hard-wired into switch S_2 and in this instance, the upper alarm light 40 is a green light which indicates that all systems (equipment and atmosphere) are normal. The green light should show on

all the time. The middle light is an amber light which will light to indicate that there is an equipment malfunction regarding the microprocessor, analyser, gas injector, triple evaluation unit etc. or when there is a low level gas leakage in the cabin. The lower red light 42 lights up to indicate a high gas leakage and is a high priority alarm.

The cabin 1 is also provided with its own interior light (not shown).

The aforementioned description relates to the operation of the components housed in the front of the cabin and the operation of the equipment housed in the rear of the cabin will now be described with reference to FIGURES 3 and 4.

FIGURE 3 shows a much simplifed schematic view of the inside of the storage compartment which can be accessed through the back door (of identical size to the front door) of the cabin 1. FIGURE 4 is a plan view of the cabin and shows the relative size of the portion of the cabin which can be accessed through the front door to the size of the storage compartment which may be accessed through the back. Of course, the relative sizes of the front of the cabin and rear storage compartment may be varied to suit individual requirements. As shown in FIGURE 3, cannisters of chlorine gas 101 (only three

cannisters of gas are shown in this instance but of course more may be provided if desired) are mounted on the facing wall 102 by means of a cannister or bottle clip rack 103. The cannisters of chlorine gas 101 are connectable to an associated vacuum pump 104 by means of a flexible coupling 105 and the vacuum pumps 104 are electronically controlled by means of electrical connections 106 which extend from the ductwork D at the top of the facing wall 102 of the cabin 1. Each vacuum pump 104 has a gas supply line 108 feeding gas out through the facing wall 102 to the front portion of the cabin as shown more particularly in FIGURE 2 (see "gas in"). Thus, the operation of the vacuum pumps can be selectively controlled by the microprocessor 4. Gas vent lines 109 lead to the top of the cabin 1 and through to the outside of the cabin and are used in the event that any gas needs to be vented via the vacuum pumps through to atmosphere. FIGURE 3 also shows a lamp 110 which can be switched on to light-up the storage compartment. On the right-hand inside wall 111 of the cabin is a fan 112 which can be utilised to extract air from inside the storage compartment through to outside the cabin. On the left-hand inside wall 113 of the cabin is a gas monitor 114 with detector head 115. The gas monitor 114 with its detector head 115 are used to monitor the atmosphere within the storage compartment and if there is a gas leak within the compartment the detector head 115 will pick up this information and pass

it on to the gas monitor 114 which will operate the warning alarm system to illuminate the appropriate light-on warning alarm cell 116 (see FIGURE 4) the format of which is identical to the format of alarm cell 43 mounted on the front of the cabin as previously described. Thus, careful checks are employed to monitor any chlorine gas leak. The storage compartment at the rear of the cabin is airtight and effectively self-contained and since vacuum pumps are utilised for delivering the chlorine gas through into the front of the cabin in such manner that the chlorine gas is drawn or sucked-through the supply tubing, any gas leakage in the storage compartment should be confined to said compartment rather than also filtering through to the front of the cabin.

If there is a low gas leakage detected in the storage compartment then the fan 112 will be switched on to vent the compartment but if there is a high leakage detected then the fan will be shut-off for safety reasons.

It is to be understood that the scope of the present invention is not to be unduly limited by the particular choice of terminology and that a specific term may be replaced by any equivalent or generic term where sensible. Further it is to be understood that individual features, method or functions related to the cabin or module or water treatment equipment might be individually

patentably inventive. The singular may include the plural or vice-versa where sensible. Additionally, it is possible that such a cabin or module may be arranged to treat a supply service other than water.

In particular the construction of various component parts of the water treatment and water analysing equipment being formed as replaceable modules which can be readily and easily plugged into the water treatment system may in itself be a patentable invention.

Therefore, further according to the present invention there is provided, in a water treatment system, a mounting board releasably fastenable to a wall, said mounting board carrying various components thereon, said components including at least one component requiring connection to an electrical supply and being provided with at least one plug-in connector to the electrical supply and being provided with a component requiring connection either to a gas supply or to a water supply, said last-mentioned component being provided with a readily releasable connection to said gas or water supply, the arrangement being such that the mounting board with components thereon can be readily disconnected from the remainder of the treatment system simply by releasing electrical plug connections and releasing gas or water supply pipe connections thereto, in addition to unfastening the mounting board from the wall, thereby

allowing the board and components to be removed from the system as a module or unit and replaceable by a new module or unit in the event of failure of one of the components on said board. For example, a water analyser with sample cell and quality analyser meter may be mounted as a module on a mounting board releasably fastenable to a wall. Plug-in connections to the electricity supply may run to said meter and a releasable water supply line to the sample cell. Additionally or alternatively, a gas injector may be mounted on a mounting board releasably fastenable to a wall with plug-in connections being provided to the injector as well as releasable gas supply lines.

CLAIMS

1. A water treatment apparatus comprising a transportable module or cabin fitted with water treatment equipment, the cabin or module being adapted for transportation to a site and for connection of the water treatment equipment to a water supply near to the site.

2. Apparatus as claimed in Claim 1 which can be readily and easily connected-up, in a readily disconnectable manner, to the water supply.

3. Apparatus as claimed in Claim 1 or Claim 2 in which the water treatment equipment fitted inside the cabin or module itself is multi-functional to suit a variety of different job requirements.

4. Apparatus as claimed in any one of the preceding claims in which the water treatment equipment includes an additive injection system.

5. Apparatus as claimed in any one of the preceding claims in which the additive injection system includes chlorine and/or fluorine injection and/or sulphur dioxide injection.

6. Apparatus as claimed in any one of the preceding claims in which the cabin or module is adapted for

connection to a mains electricity supply and fitted with at least one water sample quality analyser, said water sample quality analyser being adapted for connection to a water supply in order to extract samples of water and to discharge the sample water through a waste outlet into a drain on the site.

7. Apparatus as claimed in Claim 6 when dependent from Claim 4 in which injection of the additive is controlled by a computer, on evaluation of data provided by said water quality analyser, and, preferably, in which an additive injection/computer interface unit is incorporated into the computer microprocessor.

8. Apparatus as claimed in Claim 7 in which injection of the additive is also controlled in accordance with measured water flow rates in the supply.

9. Apparatus as claimed in Claim 7 or Claim 8 in which a back-up additive injector is provided in the cabin or module.

10. Apparatus as claimed in Claim 9 in which said cabin or module is connected to the water supply in order to treat the water merely by connecting up the water supply pipe to the at least one sample water quality analyser and connecting the waste water outlet from said analyser to the drain and additive supply pipes from additive gas

injectors being connected to a further injector located outside the cabin or module close to the water supply pipe itself.

11. Apparatus as claimed in any one of the preceding claims in which the cabin or module has an air-tight compartment housing gas or liquid additive (for example chlorine or fluorine) utilised in the water treatment.

12. Apparatus as claimed in Claim 11 in which the gas is housed in canisters or bottles in the air-tight compartment.

13. Apparatus as claimed in Claim 11 or Claim 12 in which the air-tight compartment is provided with its own door in order to allow independent access to said air-tight compartment, said cabin having a further door which allows access to the water treatment equipment.

14. Apparatus as claimed in any one of the preceding claims in which the cabin or module is provided with an alarm warning system which will give an indication of equipment malfunction and/or low gas leakage and/or high gas leakage and/or verification that all systems are normal.

15. Apparatus as claimed in Claim 14 when dependent from Claim 11 in which an alarm warning system is fitted

independently to said air-tight compartment.

16. Apparatus as claimed in any one of the preceding claims including a thermostat for temperature regulation in the cabin or module.

17. Apparatus as claimed in any one of the preceding claims including a heater.

18. Water treatment apparatus substantially as herein described with reference to the FIGURES of the accompanying drawings.

19. Apparatus as claimed in Claim 1 in which the module or cabin is substantially as herein described with reference to FIGURE 1 of the accompanying drawings.

20. Apparatus as claimed in Claim 1 in which the module or cabin has an airtight compartment substantially as herein described with reference to FIGURES 3 and 4 of the accompanying drawings.

21. Apparatus as claimed in Claim 1 in which the water treatment equipment is substantially as herein described with reference to FIGURES 2 and 5 of the accompanying drawings.

22. A method of treating water, for example, injecting

chlorine or other additive in the required dosage amounts into a water supply, said method comprising:

(a) fitting out a cabin or module with water treatment equipment;

(b) transporting said cabin or module to a site and connecting same to the water supply in order to treat the water as and when required, the arrangement being such that the cabin or module can be disconnected from the water supply and removed from the site as a unit for use at another site should it become redundant at the site.

23. A method of treating water comprising installing a series of water treatment cabins or modules along a water supply system in order to monitor the quality of the water at various locations along the water supply line and to treat the water at that location (for example by the injection of chlorine) as and when required, said cabins or modules each being fitted out with water treatment equipment and being adapted for connection to, and disconnection from, the water supply as a unit.

24. A method as claimed in Claim 22 or 23 and substantially as herein described.

25. A portable water treatment station which is in the form of a unit fitted out with water treatment equipment which may readily be connected up on site to a water

supply.

26. A station as claimed in Claim 25 in which the only connections necessary for connecting in the water treatment station are for water input to the treatment station, water output for waste water from the unit and an outlet from the unit, arranged in use to carry chlorine gas or other additives for treating the water.

27. A station as claimed in Claim 26 in which additionally, there is connection provided to mains electricity.

28. A station as claimed in any of Claims 25 to 27 which is automatic, preferably, with a manual override system.

29. A station as claimed in any one of Claims 25 to 28 which has a primary water treatment unit and a back-up water treatment unit.

30. A station as claimed in any one of Claims 25 to 29 including three water quality analysers and a triple evaluation unit.

31. A portable water treatment station fitted out with water treatment equipment, the arrangement being such that the station can be transported to a site and connected up to sample the quality of the water and to

automatically administer treatment to the water under the control of a computer housed within said water treatment station, said water treatment station further housing a supply of a water treatment additive (for example chlorine).

32. A station as claimed in Claim 31 in which the supply of water treatment additive is housed within an airtight sealed compartment within the water treatment station, which compartment is isolated from the water quality analysing equipment, water treatment administering equipment and computer control.

33. In a water treatment system, a mounting board releasably fastenable to a wall, said mounting board carrying various components thereon, said components including at least one component requiring connection to an electrical supply and being provided with at least one plug-in connector to the electrical supply and being provided with a component requiring connection either to a gas supply or to a water supply, said last-mentioned component being provided with a readily releasable connection to said gas or water supply, the arrangement being such that the mounting board with components thereon can be readily disconnected from the remainder of the treatment system simply by releasing electrical plug connections and releasing gas or water supply pipe connections thereto, in addition to unfastening the

mounting board from the wall, thereby allowing the board and components to be removed from the system as a module or unit and replaceable by a new module or unit in the event of failure of one of the components on said board.

34. A system as claimed in Claim 33 in which a water analyser with sample cell and quality analyser meter are mounted as a module on a mounting board releasably fastenable to a wall.

35. A system as claimed in Claim 33 or 34 in which plug-in connections to the electricity supply run to said meter and a releasable water supply line to the sample cell.

36. A system as claimed in any one of Claims 33 to 35 in which a gas injector is mounted on a mounting board releasably fastenable to a wall with plug-in connections being provided to the injector as well as releasable gas supply lines.

37. A system as claimed in Claim 33 subtantially as herein described with reference to FIGURE 2 of the accompanying drawings.

38. A system as claimed in Claim 33 and including a mounting board substantially as herein described with reference to FIGURE 2 of the accompanying drawings.

ents Act 1977
Examiner's report to the Comptroller under ction 17 (The Search Report)

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Relevant T chnical fields

(i) UK Cl (Edition K) C1C (CTCG,CSCG,CLB,CWB,CLD)

(ii) Int Cl (Edition 5) C02F

Search Examiner
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Databases (see over)
(i) UK Patent Office

(ii)

Date of Search
22.7.91

Documents considered relevant following a search in respect of claims 1,22,25 and 31

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2007637 A (REICHLING)	1-5,16, 17,22, 25-27
X	GB 1026172 (JORDAN)	1,2,4,5, 14,22, 25,28
X	WO 84/04087 A1 (ECOLOCHEM)	1-3,17, 22, 25
X	WO 82/04197 A1 (ECOLOCHEM)	1-3,14, 17,22 25,28
X	US 4687574 (HELLMAN)	1-5,22, 25
X	US 4196081 (PAVIA)	1,2,22, 25

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